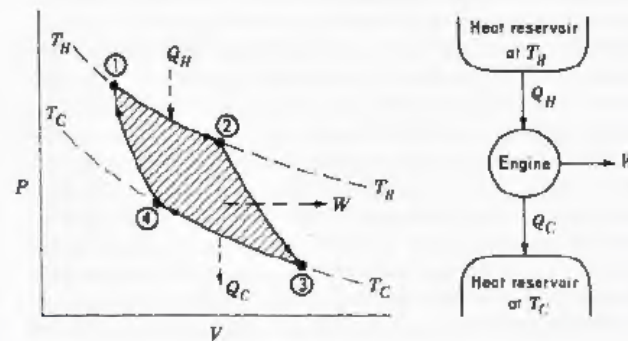


In the figure below the process from state 1 to state 4 and back to 1 can be used to construct a set of thermodynamic arrows of time pointing from state to state.

THE PROCESS ILLUSTRATED AT THE RIGHT COULD BE REVERSED BY DOING WORK ON THE SYSTEM OR EXTRACTING WORK FROM THE SYSTEM



THERMODYNAMIC 'ARROWS OF TIME' CAN BE APPLIED TO THE PROCESS PATHWAYS POINTING FROM INITIAL TO FINAL STATES ALONG THE SYSTEM DIAGRAM AT LEFT

NOTE THAT APPLIED ARROWS OF TIME BY AN OBSERVER ARE SCALED USING AN EXTERNAL CLOCK TO QUANTIFY THE TIME SCALE

A THERMODYNAMIC ARROW OF TIME DEFINED FOR A PROCESS THAT INVOLVES ENERGY FLOW [Q] AND WORK [W]

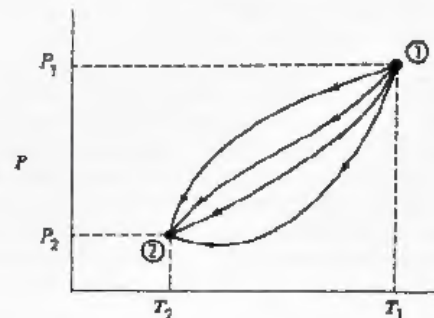
THE THERMODYNAMIC ARROW OF TIME POINTING FROM THE INITIAL (1) TO THE FINAL (2) STATES OF THE SYSTEM

| T | P | V | Q_{rev} | W_{rev} | INITIAL STATE USED TO DEFINE INITIAL TIME |
|-------|-------|-------|-------------|-------------|---|
| T_1 | P_1 | V_1 | 0 | 0 | $t(1)$ |
| T_2 | P_2 | V_2 | Q_{rev}^f | W_{rev}^f | $t(2)$ |

* The superscript f to Q_{rev} and W_{rev} indicates a final value.



ALL THE THERMODYNAMIC LAWS ARE NOT VIOLATED DURING THE FORWARD PROCESS OR ITS PROCESS REVERSAL



THE PATHS FROM STATE (1) TO STATE (2) CAN BE USED TO DEFINE PROCESS DEPENDENT THERMODYNAMIC ARROWS OF TIME 'ALONG' THESE PATHS WHEN COMPARED TO A STANDARD CLOCK

In the figure above we see that a thermodynamic arrow of time can be assigned to the process from state 1 to state 2.

PROCESS REVERSAL IS NOT TIME REVERSAL !!!